FORM PTO-1390 (REV. 1-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: FI991280/AH

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 09/980494

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FI00/00487	May 31, 2000	June 4, 1999

TITLE OF INVENTION: BREATHABLE THERMOPLASTIC POLYMER CASING FOR THE MANUFACTURE OF MEAT PRODUCTS

APPLICANT(S) FOR DO/EO/US: Tor JOHANSSON

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [X] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [X] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [ ] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
    [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information:

International Preliminary Examination Report.
Application Data Sheet.
Search Report.
Abstract.

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/980494	INTERNATIONAL APPLICATION NO. PCT/FI00/00487	JC10 Rec'd PCT/PTO 04 DEC 2001 ATTORNEY'S DOCKET NUMBER FI991280/AH

17. [X] The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... $1,040.		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... 890.		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... 740.		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... 710.		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... 100.		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 1,040	
Surcharge of $130.00 for furnishing the oath or declaration later than [ ] 20 [X] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 130	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	24 - 20 =	4	x $ 18.	$ 72	
Independent claims	- 3 =		x 84.	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ 280.	$	
TOTAL OF ABOVE CALCULATIONS =				$ 1,242	
Reduction of 1/2 for small entity				$	
SUBTOTAL =				$ 1,242	
Processing fee of $130.00 for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$	
TOTAL NATIONAL FEE =				$ 1,242	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$	
TOTAL FEES ENCLOSED =				$ 1,242	
				Amount to be refunded:	$
				charged:	$

a. [X] A check in the amount of $ 1,242 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required by 37 CFR 1.16 and 1.17, or credit any overpayment to Deposit Account No. 25-0120. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

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December 4, 2001

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APPLICATION INFORMATION

Title Line One::	BREATHABLE THERMOPLASTIC POLYMER
Title Line Two::	CASING FOR THE MANUFACTURE OF
Title Line Three::	MEAT PRODUCTS
Application Type::	UTILITY
Docket Number::	FI991280/AH

REPRESENTATIVE INFORMATION

Representative Customer Number::	000466

CONTINUITY INFORMATION

This application is a::	371 OF
>Application One::	PCT/FI00/00487
Filing Date::	MAY 31, 2000

PRIOR FOREIGN APPLICATION

Foreign Application One::	991280
Filing Date::	JUNE 4, 1999
Country::	FINLAND
Priority Claimed::	YES

PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Tor JOHANSSON

Serial No. (unknown)

Filed herewith

BREATHABLE THERMOPLASTIC POLYMER CASING FOR THE MANUFACTURE OF MEAT PRODUCTS

PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to the first Official Action and calculation of the filing fee, please substitute claims 1-26 as originally filed, which appear on pages 25-28, with Article 19 amended claims 1-24.

Further, please substitute the above claims with the Article 34 amended claims filed with the Examination Report on September 14, 2001. The pages containing these Article 34 claims are marked "AMENDED SHEET" and are attached hereto. Please amend these claims as follows:

IN THE CLAIMS:

Claims 3-10, 13, 14 and 17-24 have been amended as follows:

--3. (amended) A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the

thermoplastic polymer comprises polyamide blocks and polyether blocks.--

--4. (amended) A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the thermoplastic polymer comprises a polymer with polyamide 12 blocks and with polyethylene glycol blocks or polypropylene glycol blocks or polytetramethylene glycol blocks or mixtures thereof, preferably polyethylene glycol blocks.--

--5. (amended) A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000, and the number-average molar mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.--

--6. (amended) A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the casing is oriented or unoriented and it comprises one or two or more layers, and the layers comprise the same polymer or different polymers.--

--7. (amended) A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the

casing is permeable to smoke, CO_2, O_2 and other gases and impermeable to microbes.--

--8. (amended) A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the casing is smokeable.--

--9. (amended) A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the casing is resistant to deterioration by cellulolytic enzymes and that it is curvable.--

--10. (amended) A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the dry sausage is salami-type sausage.--

--13. (amended) A method according to claim 11 for the manufacture of dry sausages, **characterized** in that the casing comprises one or two or more layers which are extruded or coextruded and the layers comprise the same polymer or different polymers.--

--14. (amended) A method according to claim 11 for the manufacture of dry sausages, **characterized** in that the dry sausage is salami-type sausage.--

--17. (amended) Use according to claim 15of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the thermoplastic polymer comprises polyamide blocks and polyether blocks.--

--18. (amended) Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that thermoplastic polymer comprises a polymer with polyamide 12 blocks and with polyethyleneglycol blocks or polypropylene glycol or polytetramethylene glycol or mixtures thereof, preferably polyethylene glycol.--

--19. (amended) Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000, and the number-average molar mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.--

--20. (amended) Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is oriented or unoriented and it comprises one or two or more layers, and the layers comprise the same polymer or different polymers.--

--21. (amended) Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is permeable to smoke, CO_2, O_2 and other gases and impermeable to microbes.--

--22. (amended) Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is smokeable.--

--23. (amended) Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is resistant to deter-ioration by cellulolytic enzymes and that it is curvable. --

--24. (amended) Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the dry sausage is salami-type sausage.--

R E M A R K S

The above changes in the specification and claims merely place this national phase application in the same condition as it was during Chapter II of the international phase, with the multiple dependencies being removed. Follow-

ing entry of this amendment by substitution of the pages, only the Article 34 claims 1-24 of 14 September 2001 remain pending in this application.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Respectfully submitted,

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By ______________________

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December 4, 2001

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claims 3-10, 13, 14 and 17-24 have been amended as follows:

3. A breathable polymer casing for dry sausages according to claim 1~~ or 2~~, **characterized** in that the thermoplastic polymer comprises polyamide blocks and polyether blocks.

4. A breathable polymer casing for dry sausages according to ~~any one of claims 1-3~~claim 1, **characterized** in that the thermoplastic polymer comprises a polymer with polyamide 12 blocks and with polyethylene glycol blocks or polypropylene glycol blocks or polytetramethylene glycol blocks or mixtures thereof, preferably polyethylene glycol blocks.

5. A breathable polymer casing for dry sausages according to ~~any one of claims 1-4~~claim 1, **characterized** in that the number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000, and the number-average molar mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.

6. A breathable polymer casing for dry sausages according to ~~any one of claims 1-5~~claim 1, **characterized** in that the casing is oriented or unoriented and it comprises one or two

or more layers, and the layers comprise the same polymer or different polymers.

7. A breathable polymer casing for dry sausages according to ~~any one of claims 1-6~~claim 1, **characterized** in that the casing is permeable to smoke, CO_2, O_2 and other gases and impermeable to microbes.

8. A breathable polymer casing for dry sausages according to ~~any one of claims 1-7~~claim 1, **characterized** in that the casing is smokeable.

9. A breathable polymer casing for dry sausages according to ~~any one of claims 1-8~~claim 1, **characterized** in that the casing is resistant to deterioration by cellulolytic enzymes and that it is curvable.

10. A breathable polymer casing for dry sausages according to ~~any one of claims 1-9~~claim 1, **characterized** in that the dry sausage is salami-type sausage.

13. A method according to claim 11 ~~or 12~~ for the manufacture of dry sausages, **characterized** in that the casing comprises one or two or more layers which are extruded or coextruded and the layers comprise the same polymer or different polymers.

14. A method according to ~~any one of claims 11-13~~claim 11 for the manufacture of dry sausages, **characterized** in that the dry sausage is salami-type sausage.

17. Use according to ~~any one of~~ claim ~~15 or 16 of~~15of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the thermoplastic polymer comprises polyamide blocks and polyether blocks.

18. Use according to ~~any one of claims 15-17~~claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that thermoplastic polymer comprises a polymer with polyamide 12 blocks and with polyethyleneglycol blocks or polypropylene glycol or polytetramethylene glycol or mixtures thereof, preferably polyethylene glycol.

19. Use according to ~~any one of claims 15-18~~claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000, and the number-average molar mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.

20. Use according to ~~any one of claims 15-19~~claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is oriented or unoriented and it comprises one or two or more layers, and the layers comprise the same polymer or different polymers.

21. Use according to ~~any one of claims 15-20~~claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is permeable to smoke, CO_2, O_2 and other gases and impermeable to microbes.

22. Use according to ~~any one of claims 15-21~~claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is smokeable.

23. Use according to ~~any one of claims 15-22~~claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is resistant to deterioration by cellulolytic enzymes and that it is curvable.

24. Use according to ~~any one of claims 15-23~~claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the dry sausage is salami-type sausage.

Claims

1. A breathable polymer casing for dry sausages, **characterized** in that the casing comprises thermoplastic polymer having polyether chains and with a moisture vapour transmission rate (MVTR) of equal or more than 500 g/m^2/24 hours measured by the ASTM E96 BW method.

2. A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the moisture vapour transmission rate (MVTR) is 2.000 - 20.000 g/m^2/24.

3. A breathable polymer casing for dry sausages according to claim 1 or 2, **characterized** in that the thermoplastic polymer comprises polyamide blocks and polyether blocks.

4. A breathable polymer casing for dry sausages according to any one of claims 1-3, **characterized** in that the thermoplastic polymer comprises a polymer with polyamide 12 blocks and with polyethylene glycol blocks or polypropylene glycol blocks or polytetramethylene glycol blocks or mixtures thereof, preferably polyethylene glycol blocks.

5. A breathable polymer casing for dry sausages according to any one of claims 1-4, **characterized** in that the number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000, and the number-average molar mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.

6. A breathable polymer casing for dry sausages according to any one of claims 1-5, **characterized** in that the casing is oriented or unoriented and it comprises one or two or more layers, and the layers comprise the same polymer or different polymers.

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7. A breathable polymer casing for dry sausages according to any one of claims 1-6, **characterized** in that the casing is permeable to smoke, CO_2, O_2 and other gases and impermeable to microbes.

8. A breathable polymer casing for dry sausages according to any one of claims 1-7, **characterized** in that the casing is smokeable.

9. A breathable polymer casing for dry sausages according to any one of claims 1-8, **characterized** in that the casing is resistant to deterioration by cellulolytic enzymes and that it is curvable.

10. A breathable polymer casing for dry sausages according to any one of claims 1-9, **characterized** in that the dry sausage is salami-type sausage.

11. A method for the manufacture of dry sausages, **characterized** in that meat mass is extruded into a casing and then matured and optionally smoked, and the casing is a breathable polymer casing comprising thermoplastic polymer having polyether chains and with a moisture vapour transmission rate (MVTR) of equal or more than 500 g/m^2/24 hours, preferably 2.000 - 20.000 g/m^2/24, measured by the ASTM E96 BW method and that the casing is extruded, casted or blown.

12. A method according to claim 11 for the manufacture of dry sausages, **characterized** in that the casing is oriented or unoriented.

13. A method according to claim 11 or 12 for the manufacture of dry sausages, **characterized** in that the casing comprises one or two or more layers which are extruded or coextruded and the layers comprise the same polymer or different polymers.

14. A method according to any one of claims 11-13 for the manufacture of dry sausages, **characterized** in that the dry sausage is salami-type sausage.

15. Use of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing comprises thermoplastic polymer having polyether chains and with a moisture vapour transmission rate (MVTR) of equal or more than 500 g/m^2/24 hours measured by the ASTM E96 BW method.

16. Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the moisture vapour transmission rate (MVTR) of the casing is 2.000 - 20.000 g/m^2/24.

17. Use according to any one of claim 15 or 16 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the thermoplastic polymer comprises polyamide blocks and polyether blocks.

18. Use according to any one of claims 15-17 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that thermoplastic polymer comprises a polymer with polyamide 12 blocks and with polyethyleneglycol blocks or polypropylene glycol or polytetramethylene glycol or mixtures thereof, preferably polyethylene glycol.

19. Use according to any one of claims 15-18 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000, and the number-average molar mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.

20. Use according to any one of claims 15-19 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is oriented or unoriented and it comprises one or two or more layers, and the layers comprise the same polymer or different polymers.

21. Use according to any one of claims 15-20 of a polymer for the manufacture of

breathable polymer casings for dry sausages, **characterized** in that the casing is permeable to smoke, CO_2, O_2 and other gases and impermeable to microbes.

22. Use according to any one of claims 15-21 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is smokeable.

23. Use according to any one of claims 15-22 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is resistant to deterioration by cellulolytic enzymes and that it is curvable.

24. Use according to any one of claims 15-23 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the dry sausage is salami-type sausage.

ABSTRACT OF THE DISCLOSURE

A breathable polymer food casing for the manufacture of meat products, such as dry sausages and cooked sausages and a method for the manufacture thereof. Additionally, the invention relates to the use of a film or casing which is permeable to water vapour for dehydrating and/or maturing and/or smoking of meat products and more particularly to the use of films which are permeable to water and gases and which are continuous, that is to say which do not comprise perforations. The casing and/or film comprises thermoplastic polymer having polyether chains and with a moisture vapour transmission rate (MVTR) of equal or more than 150 $g/m^2/24$ hours measured by the ASTM E96 BW method.

Breathable thermoplastic polymer casing for the manufacture of meat products

This invention relates to a food casing and more particularly to a breathable polymer food casing for stuffing food products, such as meat products like dry sausages and cooked sausages and to a method for the manufacture thereof. Additionally, the present invention relates to the use of a film or casing which is permeable to water vapour for dehydrating and/or maturing food products and more particularly to the use of films which are permeable to water and/or smoke and which are continuous, that is to say which do not comprise perforations.

Food casings formed from synthetic materials and particularly from regenerated cellulose are widely used in the preparation of processed meat products such as sausage products and they replace earlier used casings formed from natural materials. A fibrous casing consists of a fibrous web formed into a tube and impregnated with regenerated cellulose. Differences in meat products, sausage recipes and modes of processing make it difficult to provide a casing that is suitable for all types of sausage products.

Dry sausages, such as salami and the like, are usually processed by maturing for extended periods of time rather than cooking. The manufacture and maturing process of dry sausages is a complex interaction of so-called internal control variables e.g. recipe and external control variables e.g. climate. The internal control variables comprise common salt and sugar content, fat content, degree of comminution, casing and starter cultures. The external control variables comprise relative humidity, temperature and air velocity. A bacterial pure culture i.e. a starter culture is used to ensure the designed colour formation and to produce acids, mainly lactic acid that lower the pH value. Curing takes usually place in a smoke oven, often called a climatic chamber. The ability of meat to bind its own water is weakened because of

the lowered pH value and because the relatively high salt content controls the lowering of the pH value. As a result of the lowered pH value, the salt content and the external control variables, meat products like sausages mature. Thus water is released from the meat, then it is diffused from the core of the sausage to the surface and finally evaporated through the casing. In order to permit moisture to be removed and to enable smoke to be accessible to the sausage, the casing must be permeable to moisture and gases. Casings of the fibrous type are commercially available for the processing of a variety of dry sausages.

EP 850,567 discloses a process for the manufacture of cellulose containing casings, which are suitable for sausages such as salami. The conditions, especially conditions after maturing of dry sausages are sometimes found to result in the growth of undesirable mold and fungi on the tubular, fibrous cellulosic casings producing cellulolytic enzymes that cause deterioration of the casings and which can render the sausage product unsaleable. Also the removal of possible extrenuous material is difficult from the fibrous casings because the use of water is undesirable in connection with fibrous casings.

It is sometimes difficult to peel the fibrous casing from the sausage without breaking the casing and at worst, only separate pieces can be pulled off. The manufacturing process of fibrous casings requires several different steps and especially the problems associated with environmental aspects, such as emissions of volatile organic compounds, make the process for the manufacture of fibrous casings unattractive. When fibrous casings are used, usually an adhesion substance, such as epichlorohydrine, is needed in order to achieve the adhesion of the meat mass to the inner surface of the casing.

Solutions to the problems associated with fibrous casings in connection with dry sausages have been proposed in several publications.

US 4,780,326 discloses a composition for making pigmented protective coatings on meat products, which coatings are based on acetylated monoglycerides and cellulose

esters with additional synthetic waxes and pigments. Raw sausages are dipped into the melted composition and allowed to be dried.

US 3,935,320 discloses a tubular cellulosic casing with a kationic thermosetting resin coating which exhibits resistance to degradation by cellulolytic enzymes.

Traditional plastic casings which comprise polyester or nylon are widely used in the manufacture of stuffed food products, like cooked sausages and other moist type of sausages, which require that moisture is retained during processing and storage, thus necessitating the use of casings which are substantially impermeable. It is evident that moisture and smoke impermeable plastic casings are not suitable for the manufacture of meat products like dry sausages, such as salami or pepperoni, where moisture, smoke and gas permeability are very important features of the casings. Commonly, dry sausages are manufactured into permeable fibrous casings, collagen casings, cellophane casings or natural casings.

Meat products and particularly cooked sausages which are optionally smoked are commonly manufactures into non-edible collagen casings. Collagen originates from bovine and thus there is a potential risk for BSE and bovine induced allergy. Collagen casings have weak mechanical properties and because collagen originates from different animal sources the quality of collagen varies and effects the pealability of the sausages. The use of collagen casings in the manufacture of meat products requires careful handling. Before the manufacture of sausages collagen casings are usually treated with saline water, which has a corroding effect on the manufacturing equipment and additionally this is a potential risk for bacterial contamination.

Based on the above, it can be seen that there exists a need for a casing especially suitable for stuffed meat products, such as dry sausages and cooked sausages, which casing is easy, environmentally safe and acceptable to manufacture and which exhibits required moisture, smoke and gas permeability.

The prior art has disclosed films which are leaktight to liquid water and permeable to water vapour. Provision was first of all made for microperforated polyethylene films, the holes of which are sufficiently small to prevent the passage of water drops and sufficiently large to allow the passage of water vapour. As regards the polyethylene part, it is leaktight to liquid water and to water vapour. These films have the disadvantage of not keeping out bacteria or viruses.

EP 378,015 discloses films composed of a copolymer with polyamide blocks and polyether blocks. These films are continuous, that is to say that they do not have perforations, they are leaktight to liquid water and allow the passage of water vapour. Depending on the nature of the polyether, the moisture vapour transmission rate (MVTR) (also known as MWTR for Moist Water Transmission Rate) is higher or lower. The use was disclosed of these films to protect insulating materials, which are under the roofs of houses; humidity is lost and the water, which might infiltrate under the tiles or the slates cannot wet the insulating materials.

EP 688,826 discloses films composed of copolymers with polyether blocks as a mixture with copolymers of ethylene and of an alkyl (meth)acrylate. They are leaktight to liquid water and permeable to water vapour and, as regards copolymers with polyamide blocks and polyether blocks, they exhibit the advantage with respect to the preceding prior art (i) of having the same permeability for a lower water uptake, (ii) of being readily extrudable and (iii) of being able to be easily hot-bonded to a woven or non-woven.

EP 737,709 discloses packagings composed of a film made of copolymer with polyamide blocks and polyether blocks; they have the property of being permeable not only to water vapour but also to oxygen, to CO_2 and to ethylene. These packagings make possible the preservation of freshly harvested fruit and vegetables.

EP 803,348 discloses packagings composed of two layers of copolymers with polyether blocks, one highly permeable to water vapour and the other weakly permeable. This technique makes it possible to prevent the presence of condensation

within the packaging. The copolymers with polyether blocks are advantageously chosen from polyether-polyamide block copolymers, polyether-polyester block copolymers and polyether-urethanes.

WO 98/26004 discloses packagings composed of a film made of a mixture (i) of a copolymer with polyether blocks, (ii) of a polyethylene with a relative density of less than 0.91 and (iii) of a compatibilizing agent. By adjusting the proportions of the various constituents, films are obtained which have specific values of permeability to water vapour, to oxygen and to CO_2. These different films are of use in different kinds of preservation.

Patent **EP 829,506** discloses other films composed of a polyurethane, a copolymer with polyamide blocks and polyether blocks having been added to this polyurethane; this film is permeable to water vapour and impermeable to liquid water.

Patent **EP 842,969** discloses films composed of a mixture (i) of polyamide, (ii) of a copolymer with polyamide blocks and polyether blocks, and (iii) of an optionally functionalized polyolefin, the proportion by weight of (i) being less than 50% and the proportion of (i)+(ii) being greater than 50%. This film is permeable to water vapour and impermeable to liquid water.

Patent **WO 99/07769** discloses masterbatches (i) of copolymer with polyamide blocks and polyether blocks, (ii) of a functional copolymer, such as a styrene-maleic anhydride, and (iii) of a polyolefin which are intended to be added to polyolefins. The resulting mixture is used to prepare films which are permeable to water vapour, to CO_2 and to oxygen and impermeable to liquid water.

Patent **EP 848,019** discloses films composed of a copolymer of ethylene and of a polyethylene glycol (meth)acrylate. These films are permeable to water vapour and impermeable to liquid water.

Patent **EP 476,963** discloses films composed of a mixture (i) of a copolymer with polyamide blocks and polyether blocks which are hydrophilic, (ii) of a hydrophobic polymer which can be the preceding copolymer but with hydrophobic polyether blocks or a polyamide or a polyurethane, and (iii) optionally of a compatibilizing agent. The film is permeable to water vapour and impermeable to liquid water and has a low water uptake.

Patent **EP 91,800** discloses dressings based on a film composed of a copolymer with polyamide blocks and polyether blocks which film is permeable to water vapour and which keeps out bacteria. This dressing is used to protect, from infections, wounds which have not yet healed while drying them but while not drying them too quickly. This is because, if drying is too fast, healing takes place while the wound is still suppurating.

The prior art has not disclosed the dehydration and/or maturing and/or smoking of meat products using a continuous film as a packaging or casing.

The object of the invention is to provide a moisture (water vapour), smoke and gas permeable, breathable polymer casing and/or film for the manufacture of meat products like sausages and ham. A further object of the invention is to provide a method for the manufacture of such casings and/or film. A further object of the invention is the use of a polymer for the manufacture of a moisture and gas and smoke permeable, continuos casing and/or film for the manufacture of stuffed food products, such as meat products, like dry sausages, cooked sausages and ham.

Characteristic features of the casing and/or film, of the method for the manufacture thereof and of the use of the casing and/or film are stated in the claims.

The objects of the invention are achieved and the disadvantages of the films and casings according to the prior art are avoided or significantly reduced with the casing and/or film and the method according to the invention. The invention relates particularly to meat products, which have to be matured and/or completely or

partially dehydrated and/or smoked, the dehydration constituting a stage in their preparation. It concerns, for example, foodstuffs, such as meat products like dry sausages, cooked sausages, ham and fish products. The present invention also relates to the use of a continuous packaging film or casing which is permeable to water vapour and impermeable to liquid water for completely or partially dehydrating and/or maturing and/or smoking of food products. The term "continuous" means that the film or casing is not perforated.

It has been surprisingly found that casings based on certain polymers can be used in the manufacture of special types of food products, which require moisture (water vapour) permeability, smoke permeability and gas permeability of the casings. Especially suitable polymers are thermoplastic polymers made of flexible polymers and rigid polyamides such as polyether block amides. The thermoplastic polymers are breathable to water vapour and they are also permeable to other gases, surprisingly such as smoke, CO_2 and O_2. On the other hand, they are impermeable to microbes thus keeping out bacteria and viruses. Casings and films manufactured from the thermoplastic polymers have good mechanical properties such as tensile strength, elongation at brake, a good smooth finish, and they are resistant to the hydrolysis and deterioration by cellulolytic enzymes. The casings and films can be manufactured into desired forms, such as tubular casings, by extrusion methods using any suitable extrusion equipment known in the art. The casing can also be manufactured by blowing or casting films, which can be sealed to any desired form. The casing or film can be oriented or unoriented and it can be manufactured as a single layer casing or as a multilayer casing with two or more layers. The casings which are preferably oriented may also be curved by stretching and/or shrinking when curved sausages are desired. The multilayer casing or film can be preferably coextruded, comprising the same polymer or a different polymer in each layer or combinations of polymers, thus making it possible to manufacture casings with varying moisture permeability. Additives, such as antiblocking agents, like silica, pigments and other additives known in the art, such as plasticizers, antioxidants or UV stabilizers, may be incorporated into the casings or films or used in connection with them.

A suitable thermoplastic polymer is a polymer having polyether chains and with a moisture vapour transmission rate (MVTR) of equal or more than 150 g/m^2/24 hours, when measured using the ASTM E96 BW method. For dry sausages like salami-type sausage the preferable moisture vapour transmission rate is equal or more than 500 g/m^2/24 hours and more preferably 2.000 - 20.000 g/m^2/24 hours. Dry sausages are conveniently matured and optionally smoked in said polymer casings. For cooked sausages like bologna-type sausage the preferable moisture vapour transmission rate is equal or more than 150 g/m^2/24 hours and preferably 150 - 1.000 g/m^2/24 hours. The sausages may optionally be smoked in said casings. The moisture, smoke and gas permeability of the casing can be selected depending on the sausage which is manufactured.

The film or casing is advantageously based on a polymer having polyether chains, it being possible for these chains to be side chains (copolymer B) or to be blocks (or sequences) in the main chain (copolymer A) or to be present as side chains or as blocks.

Mention may be made, as an example of a polymer having polyether side chains, of copolymers of ethylene and of a polyalkylene glycol (meth)acrylate, such as those disclosed in Application **EP 848,019**, the contents of which are incorporated in the present application.

Mention may be made, as an example of a polymer A having polyether blocks, of the copolymer (A) of Application **WO 98/26004** which means a block copolymer in which polyoxyalkylene chains and other polymer chains are linked together, or a polymer in which polyoxyalkylene chains are connected together via coupling regions.

The polyether blocks comprise alkylene oxide units, which can be chosen from ethylene oxide, propylene oxide and -CH_2-CH_2-CH_2-CH_2-O-. The permeability

increases with the proportion of polyether and with its nature. The greater the amount of polyethylene glycol, the greater the permeability to water vapour.

The polyether blocks can represent 5 to 85% by weight of (A). The polyether blocks can comprise other units than ethylene oxide units, such as, for example, propylene oxide or polytetrahydrofuran, which results in polytetramethylene glycol linkages. It is also possible simultaneously to use PEG blocks, that is to say those composed of ethylene oxide units, PPG blocks, that is to say those composed of propylene oxide units, and PTMG blocks, that is to say those composed of tetramethylene glycol units, also known as polytetrahydrofuran blocks. Use is advantageously made of PEG blocks or of blocks obtained by oxyethylation of bisphenols, such as, for example, bisphenol A. The latter products are disclosed in Patent **EP 613,919**. The amount of polyether blocks in (A) is preferably from 10 to 50% by weight of (B).

Advantageously, (A) is a copolymer with polyamide blocks and polyether blocks.

Polymers with polyamide blocks and polyether blocks result from the copolycondensation of polyamide sequences comprising reactive ends with polyether sequences comprising reactive ends, such as, inter alia:

1) polyamide sequences comprising diamine chain ends with polyoxyalkylene sequences comprising dicarboxylic chain ends,
2) polyamide sequences comprising dicarboxylic chain ends with polyoxyalkylene sequences comprising diamine chain ends obtained by cyanoethylation and hydrogenation of α,ω-dihydroxylated aliphatic polyoxy-alkylene sequences, known as polyetherdiols,
3) polyamide sequences comprising dicarboxylic chain ends with polyetherdiols, the products obtained being, in this specific case, polyetheresteramides.

Polyamide sequences comprising dicarboxylic chain ends originate, for example, from the condensation of α,ω-aminocarboxylic acids, of lactams or of dicarboxylic

acids and diamines in the presence of a chain-limiting dicarboxylic acid. The polyamide blocks are advantageously made of polyamide-12.

The number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000. The mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.

The polyamide blocks and polyether blocks can also comprise randomly distributed units. These polymers can be prepared by the simultaneous reaction of the polyether and of the precursors of the polyamide blocks.

For example, polyetherdiol, a lactam (or an α,ω-amino acid) and a chain-limiting diacid can be reacted in the presence of a small amount of water. A polymer is obtained which has essentially polyether blocks and polyamide blocks of very variable length but also the various reactants, which have reacted randomly, which are statistically distributed along the polymer chain.

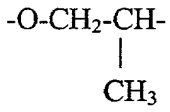
These polymers with polyamide blocks and polyether blocks, whether they originate from the copolycondensation of polyamide and polyether sequences prepared beforehand or from a one-stage reaction, exhibit, for example, Shore D hardnesses which can be between 20 and 75 and advantageously between 30 and 70 and an intrinsic viscosity between 0.8 and 2.5, measured in meta-cresol at 25°C for a starting concentration of 0.8 g/100 ml.

Whether the polyether blocks derive from polyethylene glycol, polypropylene glycol or polytetramethylene glycol, they are either used as is and copolycondensed with polyamide blocks comprising carboxylic ends or they are aminated, in order to be converted into polyetherdiamines, and condensed with polyamide blocks comprising carboxylic ends. They can also be mixed with polyamide precursors and a chain-limiting agent in order to form polymers with polyamide blocks and polyether blocks having statistically distributed units.

The polyether can be, for example, a polyethylene glycol (PEG), a polypropylene glycol (PPG) or a polytetramethylene glycol (PTMG). The latter is also known as polytetrahydrofuran (PTHF).

Whether the polyether blocks are in the chain of the polymer with polyamide blocks and polyether blocks in the form of diols or of diamines, they are known for simplicity as PEG blocks or PPG blocks or PTMG blocks.

It would not be departing from the scope of the invention if the polyether blocks comprised different units, such as units derived from ethylene glycol ($-OC_2H_4-$), from propylene glycol



or from tetramethylene glycol ($-O-(CH_2)_4-$).

The polymer with polyamide blocks and polyether blocks preferably comprises a single type of polyamide block and a single type of polyether block. Use is advantageously made of polymers with PA-12 blocks and PEG blocks and of polymers with PA-12 blocks and PTMG blocks.

Polymers with PEG blocks have a much greater permeability to water vapour than that of polymers with PTMG blocks.

Use may also be made of a mixture of these two polymers with polyamide blocks and polyether blocks.

The polymer with polyamide blocks and polyether blocks is advantageously such that the polyamide is the major constituent by weight, that is to say that the amount of polyamide which is in the form of blocks and that which is optionally statistically distributed in the chain represents 40% by weight or more of the polymer with polyamide blocks and polyether blocks. The amount of polyamide and the amount of

polyether are advantageously in the ratio (polyamide/polyether) 1/1 to 3/1 and preferably:

The films of the invention have a thickness, for example, of between 10 and 150 μm.

The copolymers (A) and (B) can also be mixed with two or more polymers, like polyamides or polyolefins, having different types and/or ratios of soft/hard segments in each resin, or again there may be used blends with other resins providing that the amount is within a range such that the objectives of the present invention are realised.

The manufacturing process of the films or casings according to the invention is simple and it presents no environmental problems related to emissions of volatile organic compounds or undesirable smells. The polymer leftovers from the manufacturing process can be recycled to the process and practically no waste is formed. Meat products requiring moisture and gas permeability of the casing or film, such as dry sausages like salamis, pepperonis and the like, can easily be manufactured in the casings or films according to the invention. The casings or films can be in a tubular form which is sealable with metal clips or other known method or they can be heat-sealed, or they can be in flat film that is sealable to a desired form.

Another advantage of the invention relates to substances, which have to be packaged in order to be shaped during their preparation, this packaging also serving, in the following stage, subsequently to completely or partially dehydrate them. Thus meat products, such as salami, may be manufactured by extrusion of a meat mass into a tube, the dehydration and/or maturing subsequently having to be provided by this tube. Surprisingly, the dry sausages packed in casings or films according to the invention are readily smokeable just like dry sausages in conventional fibrous casings. The food product may be subjected to smoke or it may also be matured and/or dehydrated without smoke.

In the manufacture of dry sausages like salami no adhesion substances like epichlorohydrine is needed. The sausages can be cleaned and rinsed with water if needed without harming the product. The moisture and gas permeability of the casings or films can be varied depending on the food product. The thermoplastic polymer casings and films according to the invention are easily peelable leaving a smooth surface on the meat product like sausage.

Surprisingly meat products, particularly dry sausages and cooked sausages, may conveniently be manufactured into polymer casings according to the invention, wherein the moisture vapour transmission rate is equal or more than 150 g/m^2/24 hours. These sausages are smokeable and the smoked and peeled product has similar taste, odour and colour when compared to similar products manufactured into conventional casings. Also the concentrations of certain major smoke components, of guaiacol and m-cresol and p-cresol, are at the same levels in sausages manufactured into the casings according to the invention when compared to sausages manufactured into traditional collagen casings. Curved sausages can be manufactured by using oriented casing material. Meat products, particularly sausages manufactured into the casings according to the invention require no further re-packaging because the casing material is microbe proof. Additionally the casing resists action of cellulolytic enzymes and thus problems of conventional cellulose casings are also avoided.

The invention is further illustrated in the following examples, which however are not meant to limit the scope of the invention.

Example 1

Salami type sausage was manufactured using an extruded thermoplastic polymer casing comprising copolymer with polyamide 12 blocks with molecular weight of 4500 and with PEG blocks with a molecular weight of 1500, and MFI between 4 and 8 (235°C under 1 kg), with an extrusion diameter of 75 mm and a moisture vapour transmission rate MVTR of approximately 500 g/m^2/24 hours. As a reference casing

a conventional fibrous casing with an extrusion diameter of 70 mm was used. The following experimental parameters expressing the quality of dry sausages were monitored during the maturing process:

1. Acidity degree (pH value)
2. Firmness
3. Weight loss

The pH values of the sausages were measured every day during the first three days and then after the sausages had matured. Firmness was controlled to ensure that a drying ring had not occurred and that the sausages were acceptable. The weight loss of dry sausage during ripening is normally expressed as a percentage, the weight determined at the time of sampling being related to the initial weight on the day of manufacture. After 60 hours, the pH value of the test sausage varied between 4.8 and 4.9 and the pH value of the reference sausage varied between 4.7 and 4.8. The typical red colour for a dry sausage was developed in a normal way within 36 hours. The weight loss is presented in the following Table 1.

Table 1

Weight loss of salami sausage manufactured in thermoplastic polymer casing.

Time (days)	Weight loss (%)
2.5	2.9
6.5	8.2
7.5*	10.3
10.5	17.5
13.5	21.4
15.5	23.8
17.5	25.3
20.5	27.7
24.5	30

* after maturing warehousing started

The maturing time of 24—25 days to the weight loss of 30 % is a normal time for a dry sausage with this diameter.

The weight loss of sausages in fibrous casings and in thermoplastic polymer (plastic) casings is presented in the following diagram 1.

Diagram 1.

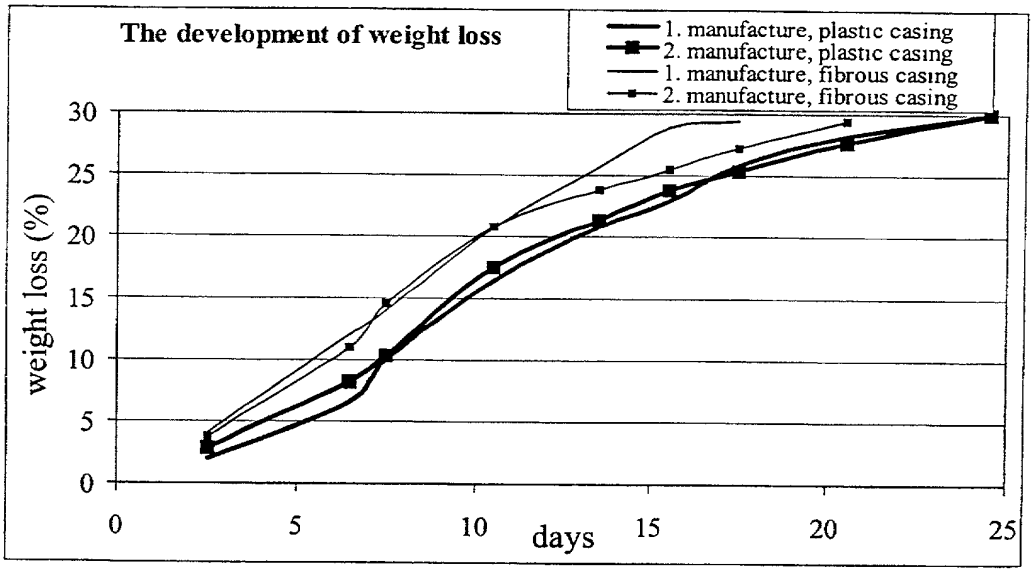


Table 2 shows the consistence (hardness) of the sausage during maturing. The measuring of consistence was performed in order to ensure that a so-called drying-ring was not formed to the product during maturing. Hardness is measured by pressing the measuring head (⌀ 10 mm) to the depth of 10 mm with respect to the horizontal direction of the peeled sausage. The numerical value obtained expresses the magnitude of force required to press the measuring head to a specified depth. Three parallel measurements were performed.

Table 2

Development of consistence (hardness)

Weight loss, %	Plastic casing, 1	Fibrous casing, 1	Plastic casing, 2	Fibrous casing, 2
20	5.7–6.0 kg	6.6–7.4 kg	6.4 kg	6.8 kg
25	not measured	not measured	6.8–8.4 kg	7.2–8.2 kg
30	11.5 kg	12.5 kg	8.5–9.8 kg	10 kg

The salami sausage in the thermoplastic polymer casing was more easily peelable than the corresponding salami sausage in the fibrous casing. The taste and the flavour of the ready-made salami packed in the polymer were typical of a salami of good quality.

Example 2

Smokeability-properties of four different plastic casings

Both smoke flavour and color are formed by combined effect of many agents/substances and by their reactions with the product itself. Smoke flavour and color do not necessarily form by influence of the same factors, and certain factors have also synergetic properties. Several hundreds of different compounds are detectable in curing smoke. Those compounds can be identified by usings gas chromatography in connection with mass spectrometry. However, it is not completely evident, which components of curing smoke form the smoke flavour exactly. The phenolic compounds guaiacol and meta- and para-cresol are regarded as the most significant factors as products´ flavour´s point of view. Thus the best method to evaluate the *smokyness* of the product is sensory evaluation.

Smoking provides the following effects: flavouring, coloring, preserving by anti-oxidative and antimicrobial action and formation of a secondary skin.

Smokeability means here the smoke-permeability properties of the casing and term *smokyness* refers to smoky taste, aroma and color of the final, peeled product. The *smokeability*-properties of four different plastic casings were compared with a non-edible collagen casing.

Four different plastic casings were examined. As a reference sample a commonly used, non-edible collagen casing was used. As another comparison sample in sensory evaluation a commercial product (bologna-type sausage, manufactured by Atria Oyj, Finland) prepared into impermeable plastic casing was used. Results are presented in table 3.

Table 3

Casings examined and their moisture vapour transmission rate.

Casing	Material	Moisture vapour transmission rate g/m^2/24 hours (23°C, rH 50%)
1	plastic	850
2	plastic	3000
3	plastic	50
4	plastic	2000
5	collagen, non-edible	>3000

Processing of the sausages

The sausage mix was stubbed into the sample casings and the sausages were smoked and cooked by the program characteristic to smoked sausages. Smoking process was so called hot smoke processing (50-85°C) (Tóth & Potthast, 1984). After cooking and cooling the sausages were vacuum-packed and cold-storaged at 3.5°C.

Sausage mix:

Ingredients	w/w %
pork meat	75.2
potato starch	1.5
soya protein	1.0
salt	1.7
spices	0.24
stabilizer	
antioxidant	
preservative	
water	20
total	100

Smoking process:

Smoking process	°C	rH	min.
smoking 1	70	0	6
smoking 2	70	55	6
total			12

Smoke was produced by a so called external smoke generator. The smoke generator works by the programming of the steam-cook house.

Sensory evaluation

The sensory evaluation of the products was carried out after two and after three days from processing.

The panel evaluated *smokyness* (smoke´s intensity of taste and aroma) from the peeled sausages.

The evaluation method used was so called graphic method (estimation for intensity), in which the evaluators marked their opinion of the product´s intensity of smoky taste or aroma on the 150 mm line segment. The line segment was anchored from it´s ends by the terms that described the studied property (aroma: no smoky aroma - intense smoky aroma; taste; no smoky taste - intense smoky taste).

Results

First day

The results of evaluation between samples (casings) examined are shown in Table 4. Correlation between individual properties are shown in Table 5.

Table 4

Points of sensory evaluation for each sample (casing). The casings that are marked by the same character (a or b) do not have statistical difference ($p < 0.001$) regarding the property examined.

Casing	Plastic	Plastic	Plastic	Plastic
Moisture vapour transmission rate g/m^2/24 hours (23°C, rH 50 %)	3000	850	200	50
Aroma	93.0a	79.8a	27.3b	22.4b
Taste	93.1a	94.7a	37.4b	42.9b

Table 5

Correlation between individual properties

(vp = moisture vapour transmission rate)

Properties	**Correlation**
Aroma / taste	0.98
Aroma / vp	0.85
Taste / vp	0.75

Second day

The results of evaluation between samples (casings) examined are shown in Table 6. Correlations between individual properties are shown in Table 7.

Table 6

Points of sensory evaluation for each sample (casing). The casings that are marked by the same character (a or b) do not have statistical difference ($p < 0.05$) regarding the property that was examined.

Casing	Collagen	Plastic	Plastic	Plastic	Plastic
Moisture vapour transmission rate g/m²/24 hours (23°C, rH 50 %)	-	3000	850	200	50
Aroma	100.1a	67.6b	56.0b	31.3c	24.0c
Taste	92.9a	94.1a	53.5b	42.2bc	30.1c

Table 7

Correlation between individual properties
(vp = moisture vapour transmission rate)

Properties	Correlation
Aroma / taste	0.90
Aroma / vp	0.89
Taste / vp	0.99

It can be seen from the results that the *smokyness* of the products increased as the moisture vapour transmission rate (vp) of the casings increased. As the moisture vapour transmission rate of the casing was minor (200 and 50) the *smokyness* of the product was also minor. As the moisture vapour transmission rate was 850 g/m^2/24 hours the product´s *smokyness* was already eminent, and it further increased as the moisture vapour transmission rate was 3000 g/m^2/24 hours. As the moisture vapour transmission rate was 3000 g/m^2/24 hours the product could be considered as "normal smoky".

A significant correlation was found between vp-value and *smokyness* (on an average 0.88).

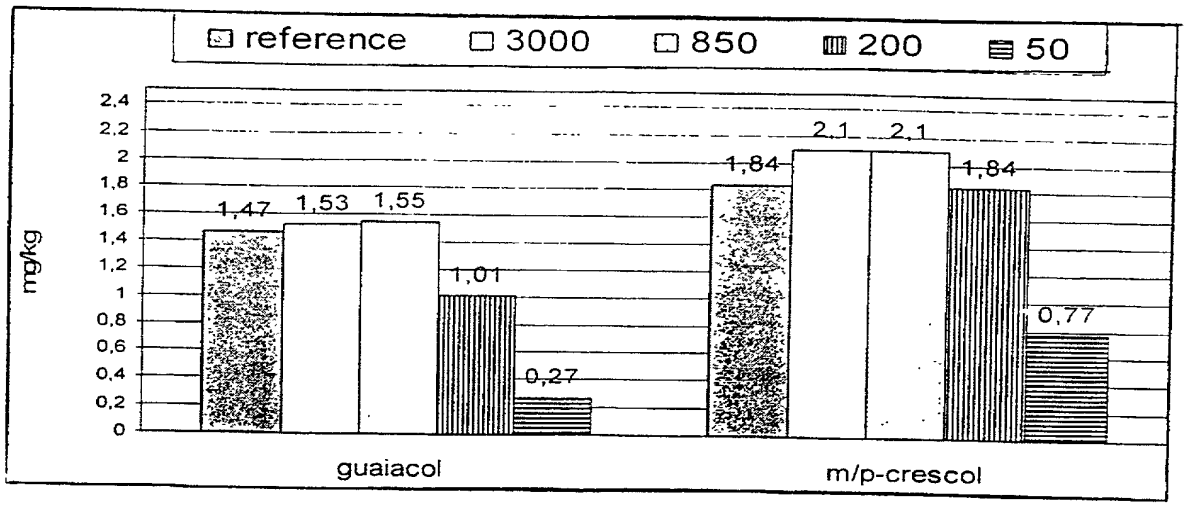
Differences between the samples were examined by the analysis of variance (LSD-method). Correlation between individual factors was examined.

Determination of guaiacol- and m/p-cresol-contents

The method of analysis used was a GC/MS-method.

The contents of guaiacol and m/p-cresol in the products are shown in diagram 2.

Diagram 2.



Guaiacol- and m/p-cresol-contens in products. Reference = sausage prepared into collagen casing. 3000, 850, 200 and 50 indicate the moisture vapour transmission rate, g/m^2/24 hr (23°C, rH 50 %), of the casings.

In the sausage prepared into casing with vp-value of 50 g/m^2/24 hours the guaiacol and m/p-cresol-contents were clearly on lower level than in the others. In the sausage prepared into casing with vp-value of 200 g/m^2/24 hours the guaiacol-content was lower than in the reference (collagen) sausage, but the m/p-cresol-content was on the same level. In the sausages prepared into casings with vp-values of 850 or 3000 g/m^2/24 hours the guaiacol- and m/p-cresol-contents were on the same level or even higher than in reference.

At the low moisture vapour transmission rate of 50 g/m^2/24 hours the product's guaiacol and m/p-cresol-contents remain considerably lower than at the moisture vapour transmission rate of 200 g/m^2/24 hours. Because at the level of 200

g/m^2/24 hours the guaiacol and m/p-cresol-contents are already quite near the contents of the reference, it can be concluded that between the moisture vapour transmission rate of 50-200 g/m^2/24 hours the product´s guaiacol and m/p-cresol-contents can be affected quite remarkable.

At the moisture vapour transmission rate of 200 g/m^2/24 hours or more, by increasing permeability, a product's guaiacol and m/p-cresol-contents can not be affected as much as on the lower permeability levels.

The results of analysis of guaiacol and m/p-cresol-contents support the results of sensory evaluation. Comparing the results of chemical analysis and sensory evaluation it can, however, be observed that guaiacol and m/p-cresol are not the only compounds in curing smoke that affect product's aroma and taste, because in sensory evaluation also with the product prepared into casing with vp-value of 200 g/m^2/24 hours the *smokyness* was considered as minor.

The *smokyness* of the product can be pointed out to be dependent on vapour permeability of the plastic casing used in particular conditions.

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Claims

1. A breathable polymer casing for dry sausages, **characterized** in that the casing comprises thermoplastic polymer having polyether chains and with a moisture vapour transmission rate (MVTR) of equal or more than 500 g/m^2/24 hours measured by the ASTM E96 BW method.

2. A breathable polymer casing for dry sausages according to claim 1, **characterized** in that the moisture vapour transmission rate (MVTR) is 2.000 - 20.000 g/m^2/24.

3. A breathable polymer casing for dry sausages according to claim 1 or 2, **characterized** in that the thermoplastic polymer comprises polyamide blocks and polyether blocks.

4. A breathable polymer casing for dry sausages according to any one of claims 1-3, **characterized** in that the thermoplastic polymer comprises a polymer with polyamide 12 blocks and with polyethylene glycol blocks or polypropylene glycol blocks or polytetramethylene glycol blocks or mixtures thereof, preferably polyethylene glycol blocks.

5. A breathable polymer casing for dry sausages according to any one of claims 1-4, **characterized** in that the number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000, and the number-average molar mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.

6. A breathable polymer casing for dry sausages according to any one of claims 1-5, **characterized** in that the casing is oriented or unoriented and it comprises one or two or more layers, and the layers comprise the same polymer or different polymers.

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7. A breathable polymer casing for dry sausages according to any one of claims 1-6, **characterized** in that the casing is permeable to smoke, CO_2, O_2 and other gases and impermeable to microbes.

8. A breathable polymer casing for dry sausages according to any one of claims 1-7, **characterized** in that the casing is smokeable.

9. A breathable polymer casing for dry sausages according to any one of claims 1-8, **characterized** in that the casing is resistant to deterioration by cellulolytic enzymes and that it is curvable.

10. A breathable polymer casing for dry sausages according to any one of claims 1-9, **characterized** in that the dry sausage is salami-type sausage.

11. A method for the manufacture of dry sausages, **characterized** in that meat mass is extruded into a casing and then matured and optionally smoked, and the casing is a breathable polymer casing comprising thermoplastic polymer having polyether chains and with a moisture vapour transmission rate (MVTR) of equal or more than 500 g/m^2/24 hours, preferably 2.000 - 20.000 g/m^2/24, measured by the ASTM E96 BW method and that the casing is extruded, casted or blown.

12. A method according to claim 11 for the manufacture of dry sausages, **characterized** in that the casing is oriented or unoriented.

13. A method according to claim 11 or 12 for the manufacture of dry sausages, **characterized** in that the casing comprises one or two or more layers which are extruded or coextruded and the layers comprise the same polymer or different polymers.

14. A method according to any one of claims 11-13 for the manufacture of dry sausages, **characterized** in that the dry sausage is salami-type sausage.

15. Use of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing comprises thermoplastic polymer having polyether chains and with a moisture vapour transmission rate (MVTR) of equal or more than 500 g/m^2/24 hours measured by the ASTM E96 BW method.

16. Use according to claim 15 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the moisture vapour transmission rate (MVTR) of the casing is 2.000 - 20.000 g/m^2/24.

17. Use according to any one of claim 15 or 16 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the thermoplastic polymer comprises polyamide blocks and polyether blocks.

18. Use according to any one of claims 15-17 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that thermoplastic polymer comprises a polymer with polyamide 12 blocks and with polyethyleneglycol blocks or polypropylene glycol or polytetramethylene glycol or mixtures thereof, preferably polyethylene glycol.

19. Use according to any one of claims 15-18 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the number-average molar mass of the polyamide sequences is between 300 and 15,000 and preferably between 600 and 5000, and the number-average molar mass of the polyether sequences is between 100 and 6000 and preferably between 200 and 3000.

20. Use according to any one of claims 15-19 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is oriented or unoriented and it comprises one or two or more layers, and the layers comprise the same polymer or different polymers.

21. Use according to any one of claims 15-20 of a polymer for the manufacture of

breathable polymer casings for dry sausages, **characterized** in that the casing is permeable to smoke, CO_2, O_2 and other gases and impermeable to microbes.

22. Use according to any one of claims 15-21 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is smokeable.

23. Use according to any one of claims 15-22 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the casing is resistant to deterioration by cellulolytic enzymes and that it is curvable.

24. Use according to any one of claims 15-23 of a polymer for the manufacture of breathable polymer casings for dry sausages, **characterized** in that the dry sausage is salami-type sausage.

Reference: FI991280

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: BREATHABLE THERMOPLASTIC POLYMER CASING FOR THE MANUFACTURE OF MEAT PRODUCTS

the specification of which: *(check one)*

REGULAR OR DESIGN APPLICATION

☐ is attached hereto.

☐ was filed on _____ as application Serial No. _____ and was amended on _____ (if applicable).

PCT FILED APPLICATION ENTERING NATIONAL STAGE

☒ was described and claimed in International application No. PCT/FI00/00487 filed on May 31, 2000 and as amended on (if any).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

PRIORITY CLAIM

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)

Country	Application Number	Date of Filing (day, month, year)	Priority Claimed
Finland	991280	04-06-1999	Yes

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional patent application(s) listed below:

Application No. Filing Date (Status—patented, pending, abandoned)

(Complete this part only if this is a continuing application.)

I hereby claim the benefit under 35 USC 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application No.) (Filing Date) (Status--patented, pending, abandoned)

POWER OF ATTORNEY

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from **FORSSEN & SALOMAA** as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

As a named inventor, I hereby appoint the registered patent attorneys represented by Customer No. **000466** to prosecute this application and transact all business in the Patent and Trademark Office connected therewith, including: **Robert J. PATCH, Reg. No. 17,355, Andrew J. PATCH, Reg. No. 32,925, Robert F. HARGEST, Reg. No. 25,590, Benoît CASTEL, Reg. No. 35,041, Thomas W. PERKINS, Reg. No. 33,027, Roland E. LONG, Jr., Reg. No. 41,949, and Eric JENSEN, Reg. No. 37,855,**

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Full name of third joint inventor, if any: _____

Inventor's signature: _____ Date: _____

Residence: _____ Citizenship: _____

Post Office Address: _____

Full name of fourth joint inventor, if any: _____

Inventor's signature: _____ Date: _____

Residence: _____ Citizenship: _____